2.2. PRE-TRIP TRAVEL INFORMATION

2.2.1 Introduction

The Pre-Trip Travel Information user service provides travelers with information prior to their departure and before a mode choice decision is made. Information provided to a traveler before a trip begins can encourage alternatives to SOV travel, including the decision not to make the trip at all. Information about TDM pricing strategies, implemented through the Electronic Payment Services (User Service 4.1), would also be available and could affect a traveler's departure time or mode choice.

Pre-trip travel information is the means by which many TDM strategies can be presented to the public. The service integrates information from various transportation modes and presents it to the user through electronic communications or public information centers. Users of the service include all travelers, including commercial vehicle operators, as well as providers who will develop and market pre-trip information services.

Although related, information provided to travelers once a trip is underway is covered under En-Route Driver Information (User Service No. 1.1) and En-Route Transit Information (User Service No. 3.2). Also related, Traveler Services Information (User Service No. 1.3) provides for a more effective selection of destination, for example the closest location of a product or service.

2.2.2 Needs

The IVHS program is a response to the increasing social and monetary costs of traffic congestion and poor mobility. As compliance with the Clean Air Act compels consideration of various TDM strategies to reduce single-occupant vehicle travel, pre-trip travel information will assist by providing a TDM information source for both employers and employees. Additionally, pre-trip travel information systems can function as an integral part of TDM measures, and interested parties will be able to expand and tailor the information systems to accommodate TDM programs.

Before a trip begins is the time when accurate information can be used to influence the traveler's choice of travel mode, travel schedule, or routing. Pre-trip travel information, if it is timely, accurate, and reliable, can assist travelers in choosing intermodal alternatives to single occupant automobiles, in deciding when, or even if, to begin a trip, and in selecting a route to desired destinations.

Before starting a trip, a traveler must select the time of departure and the mode or modes of travel. Based on pre-trip information, a person may decide to delay the trip, or not take the trip at all. One reason that mode choice often results in driving a car may be that information

about other available modes is difficult to get, inaccurate, or not timely. The intent of this user service is to ensure that people making mode and trip decisions have access to real-time information for the full range of existing travel options.

2.2.3 Service Description

Pre-Trip Travel Information systems allow travelers to access a complete range of multimodal transportation information at home, work, and other major sites where trips originate. These systems provide timely information on transit routes, schedules, transfers, and fares; intermodal connections to rail or other transportation systems; and access to ridematching services. Also included are updates of traffic and highway conditions; real-time information on incidents, accidents, road construction, alternate routes, traffic regulations and tolls; predicted congestion and traffic speeds along specific routes; parking conditions and fees; availability of park-and-ride facilities; tolls; special event information; and weather information. When fully integrated with Electronic Payment Services (User Service 4.1), the traveler could also make reservations and pay applicable fees when planning a trip.

2.2.4 Operational Concepts

Through Pre-Trip Travel Information, the traveler, including a commercial vehicle operator, gets a quick picture of travel conditions, options, and services for a particular time, along a chosen travel path. In its more advanced forms, Pre-Trip Travel Information performs a practical service, calculating routes and itineraries, and providing mode choices for the traveler based on real-time travel conditions and parameter variables provided by the traveler. Time of departure, time of arrival, total travel time, maximum number of mode transfers, preferred routes and modes, intermediate stops, weather conditions, and other such information could be included. Using these "parameter variables," the system considers current and predicted travel conditions, and presents one or more alternate itineraries.

To provide travelers with a common information medium for all transportation modes, integration of intermodal information must occur. Traffic control systems generating data about highway conditions must be integrated with public transportation systems providing transit location and route information. Paratransit services and access to ridematching systems must also be included. Integration of this service with electronic payment systems will allow travelers to pay transportation-related fees as part of the trip-planning process, and will also provide transportation pricing information that could affect mode choice and departure time decisions.

Pre-Trip Travel Information systems will likely become a part of wider information services that appeal to a range of consumer needs in addition to transportation. As interactive television and other advances by the telecommunications industry emerge, including the National Information Infrastructure, Pre-Trip Travel Information systems will complement

other home information networks such as home shopping, banking or educational services, perhaps even using the same electronic payment system used for personal transactions.

2.2.5 Technologies

Pre-trip Travel Information technologies focus on four main areas:

- Data collection
- Data communications
- Data processing
- Presentation to the user

Data collection refers to the hardware and software necessary to gather information. Data collection methods and technologies vary with the transportation mode, as described in the following paragraphs.

Cellular telephone triangulation may become an important source of vehicle location information. Real-time public transportation data includes information gathered by automated vehicle location (AVL) systems. Vehicle positions are determined using signposts, Global Positioning System (GPS), Land-based Radio Navigation System (LORAN), and others. Required technologies to support AVL systems include GPS receivers, differential transmitters, and radio voice and data communication. Technologies that expand the capacity of existing radio channels will be necessary. Route and schedule data will come from transit operators' planning offices.

Highway condition information is collected through the Traffic Control and Incident Management services (User Services Nos. 1.4 and 1.5). Technologies include inductive loops, closed-circuit television, microwave and infrared sensors, and image processing, among others. Additional highway condition information is available through Electronic Toll and Traffic Management (ETTM) systems, and equipped vehicles acting as traffic probes.

Data communications occurs between the data collection systems and the data processing systems, and between the data processing systems and the user. Technologies include telephones, cellular telephones, modems, pagers, and radio frequency, including spread spectrum.

Data processing refers to the integration of data from various modes and the transforming or converting the data to an easily understood user interface. It also includes algorithm and software development required to support interactive systems and systems that calculate travel itineraries. Data processing also involves geocoding, or finding a location on a map from an address or other description, so that the traveler knows the location of his destination prior to making pre-trip decisions. Systems involving maps will require the fusion of map data with

other data for convenient communication to the user. The technology involved includes personal computers, workstations, and mainframe computers. Systems will need to integrate data from different sources and be able to calculate and compare characteristics, such as distance or travel time, of potential route and mode alternatives.

In simple systems, information can be presented as a voice on a standard or cellular telephone, which asks the listener to push the number corresponding to the desired service, and then provides continually updated information (audiotext). Options and the degree of interactivity can vary. Automated telephone, audiotext, or videotext systems could provide transportation and other information through a single number.

Pre-Trip Travel Information, as part of a wider information network, can also be presented through personal computers with modems. Similarly, cable television or videotext can be provided with videotext terminals connected to telephone lines. Personal Communications Devices (PCDs) that combine many of these technologies into a small palmtop computer or other communications device are also being tested for Pre-Trip Travel Information applications. Some systems may provide only real-time data without any appreciable processing. Again, options and the degree of interactivity can vary.

More complex video systems may include elaborate interactive map presentations requiring larger amounts of computer memory and will probably be provided at public locations or kiosks. Complex systems may support algorithms where the traveler queries the system by indicating the origin and destination of a trip and then provides input for parameters such as travel time, departure or arrival time, and intermediate stops. The system would then calculate and describe various mode options and provide information about how to access each mode, together with graphic displays of regional congestion, link times and travel speeds to assist the traveler in making pre-trip decisions.

2.2.6 Potential Costs and Benefits

2.2.6.1 Potential Costs

Costs of Pre-Trip Travel Information include capital costs for the procurement of equipment and systems integration and operating and maintenance costs. Costs will vary with the sophistication and capacity of the systems. For each added function or capability of the system there are costs associated with data collection, communications, data processing, and program management. In addition, as a system's capabilities expand, the cost of devices to access those added capabilities will also increase. For example, a relatively simple audio information system could be accessed by telephone, but if the system expanded to include map displays of real-time bus locations, more expensive video displays would be required. However, highly integrated systems with extensive capabilities may have their higher costs offset by gains in efficiency, system flexibility, and public popularity. In addition, Pre-trip

information delivery will most likely follow other consumer services resulting from advances by the telecommunications industry which significantly reduces consumer costs and increases availability.

2.2.6.2 Potential Benefits

Potential benefits of Pre-trip Travel Information have not been quantified. However, it is anticipated that pre-trip travel information services will result in more efficient use of congested corridors by encouraging mode changes and changes in departure times and routes. Pre-Trip Travel Information will be closely linked to the Travel Demand Management service, thus increasing the benefits obtained from reducing SOV travel. Pre-trip information will also enhance the efficiency and safety of recreational travelers.

2.2.7 Assessment of Roles

The responsibility for development of IVHS services generally resides with the private sector, however, situations exist where the U.S. DOT involvement is appropriate. The development of systems with high public benefit but low commercial potential is an example, or where government, rather than the private sector, is the primary user of the service. If both the expected public benefit and the commercial potential are high, the U.S. DOT encourages joint public/private development efforts. This approach, which underlies the U.S. DOT's strategy for investment in ITS, is used below to assess the U.S. DOT's role in Pre-trip Travel Information.

2.2.7.1 Public Benefit

Many public benefits will be created: increased transit ridership, reduced congestion on roads, reduced travel times, increased traveler safety, reduced emissions, facilitation of real-time ridematching and travel demand management strategies, and increased traveler convenience.

2.2.7.2 Potential for Private Investment in Development

Potential for private investment exists in the development and sale of information systems and user interface terminals. Information systems that provide consumer services outside of transportation may prove popular enough that transportation information systems ride the "coat-tails" of more popular, privately-provided, information services.

2.2.7.3 Public and Private Sector Roles in Deployment

The deployment of Pre-trip Travel Information will be a public and private partnership. While the information infrastructure that carries transportation information will likely be

privately developed, the public sector will probably have a role in ensuring that mode choice and other information to encourage ride sharing and public transportation is included. The public's willingness to pay for highway condition information may ensure that this capability is provided by the private sector. The public sector will play a role in defining the requirements for public system use and in helping to establish open standards and architecture. Public sector involvement in the development of this service is important to assure that the functional and interoperability potentials of the systems are fully developed.

2.2.7.4 U.S. DOT Role in Developing Service

The U.S. DOT will have both a direct and supporting role in the development of Pre-trip Travel Information. In all activities supporting this service, the U.S. DOT should actively support timely establishment of standards.

2.2.7.4.1 *Research and Development*: The U.S. DOT role in research and development is high for both public transportation and highway applications. However, the public sector is largely reliant upon the creative ability of the private sector to develop prototype products for operational testing.

2.2.7.4.2 *Operational Tests*: The U.S. DOT role in operational testing is high. U.S. DOT involvement in the operational testing of integrated systems is critical to the proper development of the service. Careful evaluations are a critical element of this effort. Sites should be chosen to provide sufficient operational testing to accommodate a variety of final deployments.

2.2.7.4.3 *Institutional and Legal*: The U.S. DOT role in evaluating whether institutional or legal issues present barriers to deployment is medium. It is expected that many of the perceived problems will be resolved through the initiative of the private sector.

2.2.7.4.4 *Deployment*: The U.S. DOT role in deployment is high. U.S. DOT must work to ensure that transit operators have the resources to develop and/or participate in information systems. The U.S. DOT must also work to ensure pre-trip information systems are compatible and consistent with each other. The U.S. DOT will also foster and encourage the inclusion of pre-trip information as part of privately-provided information systems.

2.2.8 Milestones and Activities

Figure 2.2-1 presents a Gantt chart depicting the key activities, milestones, and, if applicable, decision points associated with developing this user service to a state where it is available for deployment. The accompanying supporting text identifies probable issues and describes the activities, with associated projects, identified on the Gantt chart. An issue is defined as a major potential challenge which has to be met in order to achieve deployability.

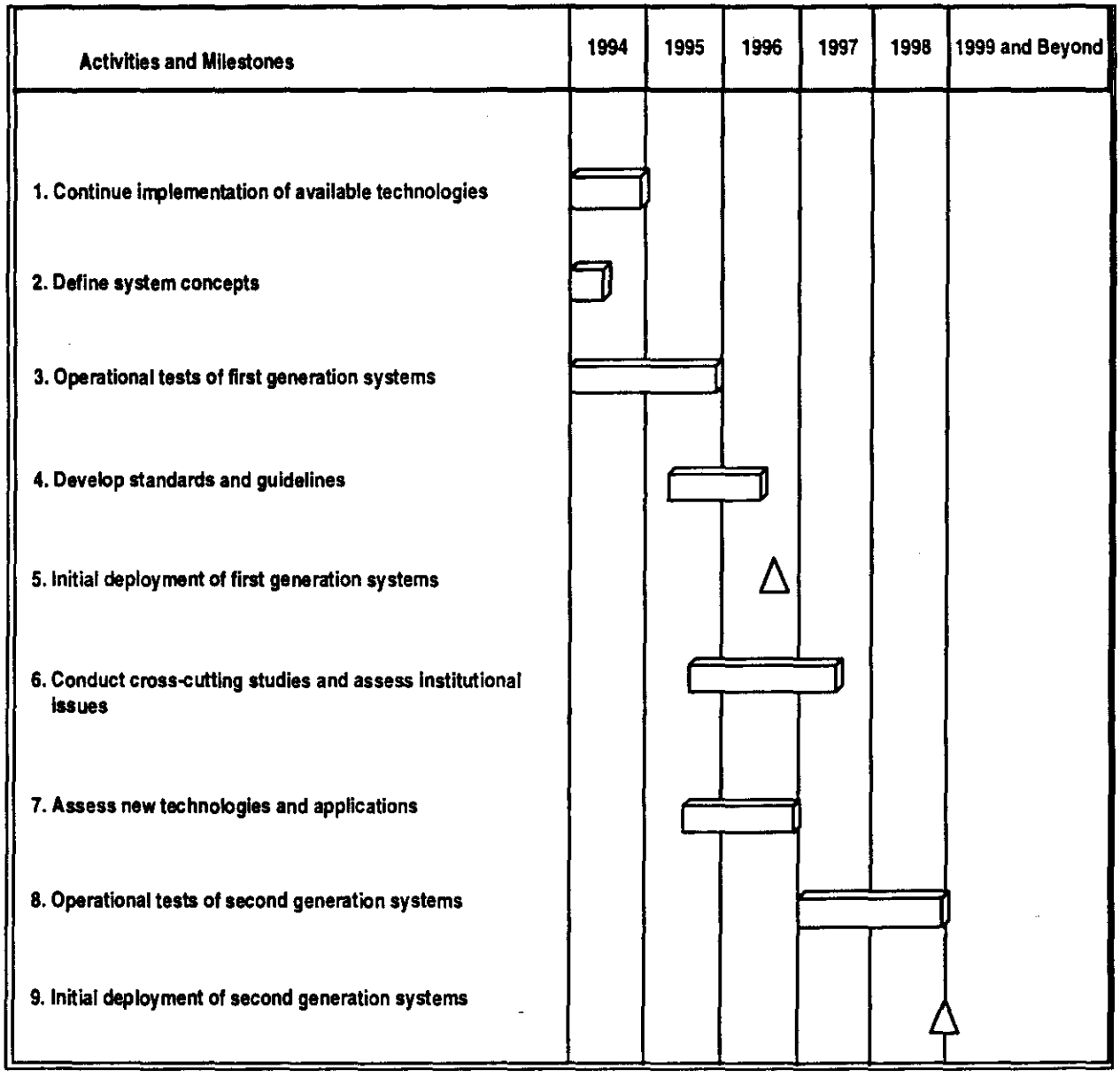

Figure 2.2-1 Pre-Trip Travel Information Activities

2.2.8.1 Issues

The key technical issues are data-oriented and include the following:

- how to obtain and integrate dynamic information from multiple sources;
- maintaining the resulting databases so they contain only current, accurate, and reliable information;
- selecting and transmitting desired portions of the information to output devices;
- presenting the information to travelers to support trip planning and decision-making.

2.2.8.2 Non-technical issues

- the reliability of the information;
- interjurisdictional cooperation as well as public/private cooperation needed to collect and disseminate reliable and accurate real-time information;
- willingness of private sector transportation providers to share information, especially negative information such as delays, with other public and private sector entities;
- costs, user-acceptance and willingness to pay for the service.

2.2.8.3 Activities:

1. Continue implementation of available technologies. Some examples of activities underway include:

    - The private sector is marketing systems with varying levels of sophistication (e.g., some use static information only.) For the most part, these systems are focused on driver information only (i.e., single travel mode.)

    - Maryland, California, New York, and Minnesota have implemented traffic information systems using cable TV.

    - Traffic information is broadcast over commercial radio and television in many jurisdictions.

    - In Southern California, transit itineraries of the Metropolitan Transportation Authority are provided by an audiotext system, and the California Highway Information Network (CHIN) provides information on freeway conditions.

    - Extensive deployment of AVL systems throughout transit fleets in preparation for information dissemination.

- Extensive deployment of traffic surveillance equipment so that accurate real-time information will be available for travel planning.

- The Visual Traffic Information Project (VTIP) provides pre-trip travel information on a color-coded map showing incidents and other traffic information along the Long Island Expressway and the Northern State Parkway in New York. Among other locations, displays are located in a major department store and at a rental car office at LaGuardia Airport.

2. Define system concepts.

   - Asses user needs and determine user perceptions of the value of systems and their willingness to pay for the service.

   - Identify the impacts of pre-trip travel information on travel behavior, and define guidelines for pre-trip information to increase the benefits of the service.

   - Explore opportunities to "piggyback" pre-trip travel information onto other information systems.

3. Operational tests of first generation systems. Some examples of operational tests currently planned or underway include:

   - Bellevue, Washington, Smart Traveler Project will test an interactive commuter information center in a downtown office building.

   - Boston SmarTraveler Project is testing a telephone-based audiotext traffic information service.

   - California Smart Traveler Project will test an audiotext/videotext traveler information system for residential and office use.

   - Houston Smart Commuter Project is developing a real-time transit and traffic information system designed to promote mode choice alternatives.

   - Minnesota GuideStar "Genesis" project will test a portable digital Personal Communications Device (PCD) designed to receive traffic and transit information.

   - Minnesota GuideStar "Travlink" project will test real-time transit information provided in the home and workplace using several different output technologies.

- The Transit Network Route Decision Aid project is developing specifications for designing, implementing, and evaluating a computerized information system that aids a telephone operator in rapidly identifying useful itineraries for passengers in a mass transit system.

- The San Francisco Bay Area TravInfo project is developing a multi-modal information system with well-defined interfaces for vendors to access.

- The Colorado Bus Transit Travel Time Information System is evaluating the impact of real-time travel information on traveler's mode choice.

- The TransCal project in California is evaluating the benefits of providing inter-regional traveler information to fixed and en-route travelers using various devices including personal digital assistants and kiosks.

- Project Northstar in New York is evaluating the use of cellular telephone, a portable digital assistant, and speech synthesis for personalized pre-trip and en-route travel information and advisories.

4. Develop standards and guidelines.

   - Based on the results of operational tests, FTA and FHWA will develop guidelines for pre-trip travel information.

   - The Society of Automotive Engineers (SAE) International Travelers Information Interchange Standards (ITIIS) Working Group is developing information interchange standards. These will be generic, non-proprietary protocols for multi-modal real-time and static traveller information dissemination and exchange.

   - The SAE Navigation Working Group is developing standards for the interface between a navigation computer and other subsystems, such as communications devices, positioning devices and the driver interface subsystem.

   - The SAE Map Database Committee, or other standards-setting group, will need to develop standards that facilitate consistent map referencing.

5. Initial deployment of first generation systems.

   - First generation systems will have limited intermodal and real-time capabilities.

   - The TravInfo project in California will evolve into an operational phase, with private vendors accessing the database and selling information to users.

3.2 EN-ROUTE TRANSIT INFORMATION

3.2.1 Introduction

The En-Route Transit Information user service provides information to transit riders after their trips have begun. The service will provide real-time, accurate, transit and high-occupancy vehicle information so that travelers can select the most convenient and time effective choice of mass transit in order to reach their destinations.

En-Route Transit Information is distinguished from Pre-Trip Travel Information (User Service No. 2.1) in that the Pre-Trip concentrates on travel and transit information prior to making a trip or mode choice. Once a trip is initiated, travel information still needs to be provided to the traveler. En-Route Transit Information discusses the service provided during the transit commute.

En-Route Driver Information (User Service No. 1.1) discusses the service provided to the driver during the commute, including information provided to transit vehicle operators (e.g., bus drivers). En-Route Driver Information also provides drivers with information on transit schedules, parking availability, etc. to support mode change decisions mid-trip based on current traffic conditions. Electronic Payment Services (User Service No. 4.1) will allow transit users to pay for services quickly and conveniently, eliminating the need for exact change or awkward collection systems.

3.2.2 Needs

Encouragement to use mass transit as a means of commuting will help alleviate traffic congestion while providing for better management of existing facilities. This transportation mode is under-utilized in most urban and suburban areas. In fact, the 1990 census data indicates that use of transit throughout the country has been continually declining. Like any other good idea, transit will not help solve the traffic congestion problem unless it is put into greater use. To increase ridership and attract riders from other modes of transportation, public transit must provide good service and deliver its product on-time.

It has been found that the perceived wait time for transit passengers is considerably longer than the actual wait time. This is particularly problematic in low density suburban areas, where service is generally infrequent. More widespread use of mass transit, and thus more effective and efficient transit operations, can be achieved through en-route transit information systems that provide better information to travelers and better integration of transit with other modes of transportation.

Transit status information provided at the appropriate time and place will assist the traveler in completing the trip with minimal disruption and with considerably less uncertainty. Thus, there is an urgent need to take steps to provide travel information while En-Route to

encourage the public to make greater use of this travel option. Capabilities exist today to provide the information in a number of languages in addition to English. Also, there are many transit users with visual and hearing impairments that need special audio and visual assistance to receive information. The application of proven advanced technologies to enhance information on public transportation can help reverse the declining trend in the use of transit as a travel mode.

Recent advancements in the fields of navigation, communications and information systems provide supporting technology using innovative methods to make transit more efficient and more attractive to potential riders, and thus more effective. It has been estimated that the diversion of just one of five solo drivers nationwide would save $30 billion per year in congestion costs.

3.2.3 Service Description

The En-Route Transit Information user service provides travelers with real-time, accurate transit network information during their travel. This information assists travelers in making effective transfer decisions and modifications as needed to a trip underway. Information also provides traveler "comfort," reduced anxiety, and convenience. The information provided is inclusive of all transit services and modes in a given area, including car and van pools and shared ride taxis and would, eventually, be available from a single source. The data would be collected from transit systems, traffic management systems, and rideshare programs; and integrated, stored, and maintained on-line for interactive access from a wide variety of locations.

3.2.4 Operational Concepts

A traveler, having already made his mode choice and initiated a travel plan, will be provided with information along the route. Interactive service would be provided through kiosks at travel information centers and other transfer points. Interactive displays on board the bus would allow queries to be made concerning various options while En-Route to a destination. Similar interactive displays would also be available at a wayside stop or transfer point. Available options for completing the trip would be given to the traveler based upon real-time information. At bus stops, a visual display would give estimated arrival times of buses based on their actual location and an audio message would announce the arriving bus and route number. The traveler would board the bus and begin the trip. While on board, the traveler would determine if a transfer could be made at a rail station En-Route. If the on board display advises that the rail service is running late, the traveler could arrange to stay on the bus for the completion of the trip. When transferring to another bus is necessary, information about connections would be available on board the first bus.

These dissemination processes could be extended to include the integration and coordination with regional paratransit services. Public and private providers would be included in the

information given throughout the jurisdiction of the service area. Each of the transit systems within the service jurisdiction would continually provide the integrated information service bureau with scheduled and actual service being provided. The information would include the next available vehicle based upon actual operating conditions. Information would be integrated with actual road and traffic data, resulting in on-the-fly route detours, where possible without missing riders.

During peak hours, there may be large crowds of people in several different queues at terminals or major stops where the same bay or stop is shared with more than one route. In these situations, the order of bus arrivals may be more important to the customer on the platform than the actual arrival time.

Since interactive displays at kiosks require on-line, interactive service similar to that offered by automatic teller machines (ATM's), arrangements can be made with the local ATM networks to tie into their communications networks to provide an integrated financial-transportation service. For example, tickets and farecards could be obtained as well as cash withdrawals in future applications of this user service.

3.2.5 Technologies

Multiple technologies can be employed for presenting the information to the traveler. Output devices include:

- Low-powered radio, which would be directed to a small geographic area and picked up by a receiver on the vehicle for transmission to the traveler. This concept is similar to that currently used for Highway Advisory Radio communication.

- Variable message signs, already used on highway systems, would provide travel information to the traveler en-route and at bus stops, and monitors would allow display to several travelers at once.

- Portable Personal Communications Devices (PCDs) would be carried by the traveler. Transportation information is but one of many applications that are anticipated for these devices.

- Interactive video displays in the form of smart kiosks at roadside or in transit centers. These would provide an on-line, interactive service.

- Audiotex over touch-tone phones.

- Videotex over television.

- Cable TV would provide information concerning the status of transit operations and would eventually do this as soon as the status changes.

- Voice Stop Annunciators announce bus stops and the bus' ultimate destination as well as preplanned reroute announcements, as required by the Americans With Disabilities Act (ADA). These are especially important to the sight impaired.

- Automatic Visual Information Signage, which is activated by annunciators, permits deployment of next-stop information for the hearing impaired. The potential for displaying advertisements in a different color can also be supported. To function without driver intervention, both the visual and voice annunciators must make use of automatic vehicle location technology.

An infrastructure must be developed to supply the information to the output devices. Technologies within the En-Route Transit Information infrastructure include computers, telecommunication equipment, digital maps, voice synthesis, transponder-based vehicle - roadside systems, tag-based automated stop identification systems, and dynamic multimodal database applications. Furthermore, on-board access to information regarding the location of a bus would be possible if a vehicle tracking system were being used locally.

Several technologies will need to be integrated to achieve the complete user service anticipated. For example, telecommunication equipment, touch-tone telephones, voice synthesis would be expected to be integrated to provide the needed user service information for smart kiosks.

3.2.6 Potential Costs and Benefits

[NOTE: Financial cost and benefit data are requested for this section of the En-Route Transit Advisory Program Plan. Targeted costs for individual equipment or systemwide cost could be used for this discussion. Distribution of costs between the public and the private sectors and the consumer could also be included.] Cost sharing is expected by non-direct users or service providers, since shifting travelers to public transit actually impacts all travelers positively in the transportation network.

3.2.7 Assessment of Roles

3.2.7.1 Public Benefit

This service has high potential for public benefit in three ways: (1) the individual traveler will benefit from being able to better use transit through the provision of real-time status information on transit-use opportunities and schedules, (2) readily available and accurate information will have the effect of "demystifying" a potentially complex experience for first time and infrequent transit users and, (3) increased convenience in using the system as a

result of having reliable real-time information on vehicle location and coordinated timed transfers. Both of these benefits are expected to result in increased market share for transit. The public as a whole will benefit from the greater use of transit that would result from this service.

3.2.7.2 Potential For Private Investment

Without U.S. Department of Transportation (U.S. DOT) funding stimulus, the private market potential for vendor products that respond to this service appears to be medium. The U.S. DOT may, for example, help to support the private sector in the development and testing of low cost products such as personal portable traveler information systems for transit applications. To be affordable, transit information may need to be distributed in conjunction with other information. For example, existing computer network services could be provided with transit data that could be communicated to the public directly, or a public service channel on cable TV could possibly arrange its programming to include transit data.

3.2.7.3 Public and Private Sector Roles In Deployment

Although this service will require both public and private sector involvement, the public sector role will be dominant. Most transit providers are public organizations. Gathering of traffic and transit information will be a public role. Establishing an information system that is capable of analyzing and assimilating the data, coordinating the network for distribution of the information, and responding to the heavy peak inquiry demands for the information could be private. It is possible that media traffic reporting companies in major metropolitan areas would desire to be a part of this effort as a logical extension of their business.

Public sector involvement in the development and deployment of this user service will occur at all levels of government, including Federal, State, Metropolitan Planning Organizations, local government, and the public transit operator. All levels are important, but the ultimate decision to deploy publicly funded systems will be made at the local level.

3.2.7.4 U.S. DOT Role In Developing Service

The U.S. DOT role for the En-Route Transit Advisory user service is to foster development, operational testing, and evaluation of technologies and systems for both transit operators and users. This role will include assistance given for the development of guidelines and standards. The U.S. DOT will also need to eliminate institutional barriers that may arise. This is especially pertinent where jurisdictions build the partnerships needed to allow the integration and cooperation required at the local level. The information will need to be shared using common formats and will allow services to be funded in new innovative ways.

3.2.7.4.1 *Research and Development*: The U.S. DOT role in research and development is moderate. The limited research which the private sector and the non-DOT public sector will

perform is expected to be very site or product specific and lacking in a national perspective. Adequate functional specifications need to be promoted by a national body.

3.2.7.4.2 *Operational Tests*: The role in operational testing for the U.S. DOT is high. Early operational testing of innovative technology applications in transit will need to be strongly supported by the U.S. DOT. There are many new technologies available from research in the defense industry with potential for commercial development in the transit industry. U.S. DOT involvement will ensure a national perspective for the full systems integration of each possible technology for appropriate transit applications. Careful evaluations are a critical element of this effort. Sites should be chosen to provide sufficient operational testing to accommodate a wide variety of final deployment projects.

3.2.7.4.3 *Institutional and Legal*: The U.S. DOT role is medium for ensuring institutional and legal issues are properly addressed. Coordination with national organizations and advisory committees to encourage compatibility will be a role for the U.S. DOT.

3.2.7.4.4 *Deployment*: The U.S. DOT role in deployment is high since the Department funds 80% of transit agencies' purchase costs of equipment. Information for the En-Route Transit Advisory will be gathered by the public sector, including local and state transportation agencies.

3.2.8 Milestones and Activities

Figure 3.0-1 in the introduction to this chapter identifies selected major milestones associated with developing this user service to a state of deployability.

This section elaborates on these milestones by identifying issues and providing a listing of more detailed, supporting activities. An issue is defined as a major potential challenge that has to be met to achieve deployability.

3.2.8.1 Issues

The key issues are data oriented. Up to the minute, real-time transit information (on vehicle locations, etc.) must be obtained. This will require major hardware and software systems to be in place, such as Automatic Vehicle Location (AVL) and computerized scheduling. Accurate databases must be maintained and kept current, incorporating schedule changes and congestion data, for example. Technologies are needed for transmitting the data to appropriate user devices, and effective means of outputting the data are needed. Improvements in radio or cellular system capacity will be needed to handle a quantum increase in communications. Finally, software must be developed for such functions as predicting travel times, recommending alternate transit routes, and determining transfer points and times.

Security of display devices at unsecured places, such as bus stops, must be addressed.

The overall benefit of the service is also an issue--to what extent will provision of this service encourage more people to use mass transit in lieu of the automobile?

3.2.8.2 Activities

1. Define En-Route Transit Information system concepts

   - The Federal Transit Administration (FTA) will be responsible for defining the system concepts, including those involving fixed location devices (e.g., kiosks) at traffic information centers and those involving portable devices on people or in vehicles. The appropriate technologies for making the data available will be considered. Candidates include kiosks, audiotex and videotex, and PCDs.

2. Sponsor En-Route Transit Information R&D

   FTA will sponsor the following R&D projects:

   - Research on the impact that traveler information has on mode choice
   - Research on the technological support needed for traveler information centers
   - Research on information display types
   - Research on formats to be used in displaying En-Route transit information
   - Initial studies will be single modal (e.g, "next bus" information). Later studies will focus on integrating multimodal information (e.g., bus/rail transfer information).

3. Conduct operational tests

   - Travel Information Centers. Kiosks and other fixed location devices will be tested using traveler information centers and home and office information using audiotex and videotex. Initial tests will focus on single modal travel (e.g., buses only). Tests will be cooperative partnerships between FTA and local transit agencies. Examples follow.

     - A Denver Smart Vehicle project will evaluate an automated, fully integrated, mass transit communications system using GPS and automatic vehicle location technologies for travelers. Major boarding and transfer points will be equipped with passenger displays.

     - The Minnesota GuideStar "Genesis" project will test a portable digital PCD that is designed to receive traffic and transit information to allow a traveler to make appropriate mode and transfer choices during the travel.

- The Minnesota "Travlink" project will evaluate real-time transit schedule and traffic information provided through a combination of kiosks and audiotex at various locations, including transit stations.

- The San Francisco Bay Area "TravInfo" project is testing a regionwide, multi-modal traveler information system to encourage the use of public transportation and ridesharing.

- A New York City operational test will evaluate the effectiveness of various methods of providing comprehensive transit information at bus stops and on-board buses.

- A Los Angeles Smart Traveler project will provide public transportation users with appropriate and timely data to improve their travel decision making. Kiosks and other fixed location devices will be tested.

- Other Traveler Information Sources. The following are included in the 1994 ITS Operational Tests chosen by U.S. DOT.

  - TransCal (California, Nevada) will test a comprehensive inter-regional Traveler Information System integrating transit, road, traffic, weather, and value-added services information sources from along the I-80/US 50 corridor between San Francisco and the Lake Tahoe-Reno metropolitan areas.

  - Seattle Wide Area Communication System--Bellevue Smart Traveler (Washington) will test three types of traveler information delivery devices: the Seiko Receptor Message Watch, an in-vehicle FM subcarrier radio to be developed by Delco Electronics, and a palm top computer provided by IBM. Each device will also support personal information and messaging services. The project will maximize the use of existing information systems, including Seattle METRO's vehicle location and scheduling systems. The Smart Traveler portion of the plan expands the 1993 FTA operational test, which supplies transit and real-time traffic information.

  - Project Northstar (New York State). Traveler Assurance Services (TAS), an existing privately-developed traveler information service, will offer additional services over an FM subcarrier combined with cellular telephone and a portable digital assistant speech synthesis for personalized en-route traveler advisories and information. Included is an element of transit information, transit incident alerts and the use of a personal security device, which could be adapted for use by public transportation passengers. The emergency notification and personal security system includes a response to customer initiated panic alerts.

- Advanced Rural Transportation Information and Coordination (ARTIC) (Minnesota) will coordinate the communications systems of several public agencies (transit, highway, and state patrol) by establishing a centralized communication site. Trilogy will provide traveler information through the Radio Broadcast Data System--Traffic Message Channel, an FM subcarrier, and 220 MHz system. Selected transit, volunteer and emergency response vehicles will be AVL equipped using portable mobile data terminals. The operational test also has a demand response element.

- Atlanta Driver Advisory System (Atlanta, Georgia) tests a traveler information system that uses an FM subcarrier for metro-wide travel advisory. Vehicles will be outfitted with in-vehicle data processing, displays and storage, and a Mayday system. Information will include traffic condition and public transit information/options (routes and schedules).

4. Develop standards and guidelines for travel information centers

   · FTA will support the development of kiosk performance standards

   · Society of Automotive Engineers (SAE) will develop Information Interchange Standards for PCDs.

5. Initial deployment of travel information centers

   · Deployment will be the responsibility of local transit agencies.

6. Conduct operational tests with portable Personal Communications Devices (PCDs)

   · Additional tests will refine testing previously conducted and will focus on traveler information using portable devices

   · The full operational concept will be explored in FTA-sponsored operational tests. These tests will incorporate the use of AVL system technologies and will include multi-modal information (e.g., bus/rail transfers).

7. Initial deployment with PCDs

   · Transit agencies will be responsible for collecting and disseminating the information. To be eligible for Federal grants, agencies will be required to adhere to standards and guidelines that have been developed

- This service will develop as consumers decide to purchase PCDs. Individual riders will be responsible for purchasing their own PCDs.

8. Initial deployment of Automatic Voice Stop Annunciators and Automatic Visual Information signage systems, which are compliant with ADA requirements.

   - FTA has funded a demonstration project to test available automated technology in Houston, Texas, where buses serving a concentration of visually impaired riders will be equipped with devices which feature both audio and visual display of next stop and destination information on the interior and voice annunciation of destination sign information on the exterior when bus doors open at stops. Demonstration projects in over 10 other cities are scheduled to get underway during 1994.

   - Several transit systems have or are in the process of procuring voice annunciation hardware which is triggered manually by the bus driver. These include Santa Clara County, California with 300 units, Stockton, California, Honolulu, Hawaii and Oklahoma City, Oklahoma.

   - New Jersey Transit is procuring an on-board passenger information system for its buses and trains which will give announcements of service changes and carry advertising. The system will ultimately be expanded into a full digital and voice annunciator system.